

**[0247]** 3) Add the string in the [Where Clause] column of the Relates table to the WHERE clause

- [0248]** 4) Consider the value of the [Join Type] column in the Relates table; if the join type indicates a many-to-any join, a GROUP BY or SELECT DISTINCT clause may have to be added to the SQL statement to eliminate the redundancy that might be introduced by this join. The term “many-to-any” is used when a many-to-one or many-to-many relationship is appropriate, as would be apparent to one of ordinary skill in the art.
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- [0249]** The first two steps in defining a query are (1) identifying the primary Entity class and (2) defining the type of query result that will be produced. The first step can be accomplished either by (a) selecting an Entity class from the Data Dictionary or (b) selecting an initial Attribute, in which case the primary Entity class is assumed to be the Entity class that is the parent of the selected Attribute. The types of query results that can be produced depend on the Entity class type of the primary Entity class; see Table 1 for an example of some of the types of queries.
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Entity Class Type	Type of Query
All Entity classes	A list query that lists selected Entities in an Entity class
All Entity classes	A count query that counts selected Entities in an Entity class
Linear Entity classes	A count density query that counts selected Entities that occur along a linear Entity and weights the results according the length of the linear Entity
Linear Entity classes	A mileage query that reports the number of road-, division-, or lane-miles
Linear Entity classes	A sub-section query that lists selected sub-sections of selected Entities in an Entity class

**Table 1. Examples of Types of Queries**

**[0250]** In this table, the first two types of queries apply to any primary Entity class. The second three types of queries apply to the following primary Entity classes: Road Sections, Division Sections, Road RCLinks, Division RCLinks, Road Intersections, Division Intersections, Road Traversals, Division Traversals, and any Road Furniture Entity classes with a linear geometry.

**[0251]** For example, a list query, as shown in Table 1, generates a list of Entities along with Attributes of those Entities (or related Entities). The result set is a table that includes (a) a column for the Entity ID of the selected Entities and (b) a column for each selected Attribute. 1

**[0252]** The Entity-Attribute structure of the data implies that there are two basic types of queries: (1) queries that select a collection of Entities and report Attributes of those Entities; and (2) queries like (1) that then group the Entities and

generate summary statistics. An example of the first kind of query is a query to support mapping (e.g., generate a list of all of the accident site locations on a specified road). An example of the second kind is a query to report road-miles (e.g., generate a list of the number of road-miles in each county). This very general classification can  
 5 be broken down further to identify more detailed query classifications. For example, there are three types of mapping queries: (1) a query whose result includes the shape column to be mapped, (2) a query whose result includes a pointer to the shape column to be mapped, and (3) a query whose result includes a Road/Division Section ID and offsets along that section that is rendered on-the-fly.

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#### *The Location Referencing Model*

[0253] One feature of the system and method is the relationship between data and the location of that data, which allows maps to be produced that depict the spatial distribution of data and to process queries that rely on the fact that data is co-located.  
 15 A characteristic of processing location-based queries is the ability for a user to specify a location of interest. For example, a user may want a list of all of the RCLinks in a particular county; in this case, the location of interest is the county. Alternately, a user may want to identify the location of an accident, in which case the location of interest is the accident site, which may be specified by RCLink and milepost.  
 20 Because the exemplary embodiment is a road network based system, these locations are generally limited to specifying positions on the road network. The Location Referencing Model describes how the user can specify road locations within the